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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/864,376	05/25/2001	Tadahiro Ohmi	107176-00007	1605

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ARENT FOX KINTNER PLOTKIN & KAHN PLLC
1050 Connecticut Avenue, N.W.
Suite 400
Washington, DC 20036-5339

EXAMINER	
ZERVIGON, RUDY	
ART UNIT	**PAPER NUMBER**
1763	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/11/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	09/864,376	OHMI ET AL.	
	Examiner	Art Unit	
	Rudy Zervigon	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 October 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9,12-14 and 16-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9,12-14 and 16-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

2. Claims 1-5, 7, 8, 9, 12, and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tokuda; Mitsuo et al (U.S. 5,134,965 A) in view of Otsubo et al (USPat. 4,985,109) and Ohmi; Tadahiro et al. (US 6,830,652 B1). Tokuda teaches a plasma processing apparatus (Figure 13) including:

i. A processing chamber (6, Figure 13; column 13, line 16 - column 14, line 5)

ii. A microwave slot antenna (34, Figure 13; column 13, line 16 - column 14, line 5) radiating antenna / radiating surface (lower surface of 34, Figure 13)

iii. A plate-shaped dielectric body (5, Figure 13; column 13, line 16 - column 14, line 5)

iv. A distance "D" (" t ", Figure 13; column 11; lines 11-25) between the microwave radiating antenna surface (lower surface of 34, Figure 13) and a surface (upper surface of 5; Figure 13) of the dielectric body (5, Figure 13; column 13, line 16 - column 14, line 5) is shown by Tokuda et al in Figure 2

v. Tokuda et al teaches a dielectric plate as discussed above

vi. Tokuda further teaches the plasma (column 3; lines 58-67) is formed between the plasma exciting surface (lowest surface of 5, Figure 13; column 13, line 16 - column 14, line 5) and the object (8; Figure 13) to be processed – claim 1

vii. Tokuda further teaches forming a standing wave microwave (column 14; lines 30-45) between Tokuda's microwave radiating surface (lower surface of 34, Figure 13) and his

plasma exciting surface (lowest surface of 5, Figure 13; column 13, line 16 - column 14, line 5).

viii. Tokuda further teaches relative spacing (" t ", Figure 13; column 11; lines 11-25) between Tokuda's plate-shaped dielectric body (5, Figure 13; column 13, line 16 - column 14, line 5) and Tokuda's plasma radiating surface (lower surface of 34, Figure 13).

Tokuda does not teach a specific thickness "d2" (Applicant's Figure 1) for his dielectric plate. Tokuda does not teach a slot antenna where a part of the number of slots is closed. Tokuda does not teach only one microwave slot antenna, as claimed by claim 1,2,7,8,16,17,23, and 24.

Tokuda is silent with respect to if one end of a standing wave microwave (column 14; lines 30-45) is positioned on Tokuda's plasma exciting surface (lowest surface of 5, Figure 13; column 13, line 16 - column 14, line 5), as claimed by claim 1, 2, 7, 8, 16, 17, 23, and 24.

Otsubo teaches a concentric slot antenna (Figure 2) in a microwave plasma reactor (Figure 1) having a number of slots (5a) formed and distributed in the microwave radiating surface where a part of the number of slots can be closed (column 7, lines 3-15). Otsubo teaches only one microwave slot antenna (Figure 2), as claimed by claim 1,2,7,8,16,17,23, and 24.

Ohmi teaches one end of a standing wave microwave is positioned on Ohmi's plasma exciting surface (top surface of 103; Figure 1), as claimed by claim 1, 2, 7, 8, 16, 17, 23, and 24 – "In order to prevent the discharge, the thickness of the dielectric material shower plate 103 is determined so that the gap is located at a position of a node of the standing wave of the microwave electric field. " (column 12, line 66 – column 13, line 20).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Tokuda to optimize the relative positions/thickness of Tokuda's dielectric plate (5, Figure 13; column 13, line 16 - column 14, line 5) with Tokuda's microwave slot antenna (34, Figure 13; column 13, line 16 - column 14, line 5), inclusive, to condense Tokuda's plural microwave slot antenna with Otsubo's single slot antenna.

Motivation Tokuda to optimize the relative positions/thickness of Tokuda's dielectric plate (5, Figure 13; column 13, line 16 - column 14, line 5) with Tokuda's microwave slot antenna (34, Figure 13; column 13, line 16 - column 14, line 5), inclusive, to condense Tokuda's plural microwave slot antenna with Otsubo's single slot antenna is for optimizing the space "between the slot antenna and the quartz window 4 through which the microwaves pass so that the microwaves emitted from the slot antenna have room to expand" (column 9, lines 6-30) as taught by Otsubo, further, motivation for Tokuda to use Otsubo's slot antenna under standing wave microwave propagation is for "easy" plasma generation as taught by Otsubo (column 19, lines 35-40). Motivation for optimizing apparatus thicknesses is for forming stable plasmas as taught by Ohmi (column 13, lines 6-15). Further, it is well established that the rearrangement of parts is considered obvious to those of ordinary skill (In re Japikse , 181 F.2d 1019, 86 USPQ 70 (CCPA 1950); In re Kuhle , 526 F.2d 553, 188 USPQ 7 (CCPA 1975); Ex parte Chicago Rawhide Manufacturing Co. , 223 USPQ 351, 353 (Bd. Pat. App. & Inter. 1984).; MPEP 2144.04). Further, it is established that the use of a one piece construction instead of interconnected components is obvious (In re Larson, 340 F.2d 965, 968, 144 USPQ 347, 349 (CCPA 1965), MPEP 2144.04).

3. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tokuda; Mitsuo et al (U.S. 5,134,965 A), Otsubo et al (USPat. 4,985,109), and Ohmi; Tadahiro et al. (US 6,830,652 B1) in view of Tsuchihashi, Masaaki et al (USPat. 6,109,208). Tokuda, Otsubo, and Ohmi are discussed above. Tokuda, Otsubo, and Ohmi do not teach plural slots of the microwave radiating antenna where the plural slots in the peripheral direction are closed. Tsuchihashi teaches a similar microwave plasma generating device (Figure 20, 21; column 11, lines 37-49) including plural slots ("slits" 6a-d, 10a-d) in the peripheral direction of the shutter antenna (26) where portions of the slots ("slits" 6a-d) in the peripheral direction can be opened ("A" direction; Figure 20) or closed (counter to "A" direction; Figure 20).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to replace Tokuda and Otsubo's microwave radiating antenna with Tsuchihashi's shutter antenna as taught by Tsuchihashi.

Motivation to replace Tokuda and Otsubo's microwave radiating antenna with Tsuchihashi's shutter antenna as taught by Tsuchihashi is for distributing microwaves as taught by Tsuchihashi to form high density plasmas (column 11, lines 37-49).

4. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tokuda; Mitsuo et al (U.S. 5,134,965 A), Otsubo et al (USPat. 4,985,109), and Ohmi; Tadahiro et al. (US 6,830,652 B1) in view of Tsuchihashi, Masaaki et al (USPat. 6,109,208). Tokuda, Otsubo, and Ohmi are discussed above. Tokuda, Otsubo, and Ohmi do not teach plural slots of the microwave radiating antenna where the plural slots in the peripheral direction are closed.

Tsuchihashi teaches a similar microwave plasma generating device (Figure 20, 21; column 11, lines 37-49) including plural slots ("slits" 6a-d, 10a-d) in the peripheral direction of the shutter

antenna (26) where portions of the slots ("slits" 6a-d) in the peripheral direction can be opened ("A" direction; Figure 20) or closed (counter to "A" direction; Figure 20).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to replace Tokuda and Otsubo's microwave radiating antenna with Tsuchihashi's shutter antenna where portions of the slots in the peripheral direction can be opened or closed as taught by Tsuchihashi.

Motivation to replace Tokuda and Otsubo's microwave radiating antenna with Tsuchihashi's shutter antenna where portions of the slots in the peripheral direction can be opened or closed as taught by Tsuchihashi is for distributing microwaves as taught by Tsuchihashi (column 11, lines 37-49).

5. Claims 16-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tokuda; Mitsuo et al (U.S. 5,134,965 A) and Otsubo et al (USPat. 4,985,109) in view of Ohmi; Tadahiro et al. (US 6,830,652 B1). Tokuda and Otsubo are discussed above. Tokuda further teaches a plasma processing apparatus (Figure 13) including a microwave (34, Figure 13; column 13, line 16 - column 14, line 5) radial line (Figure 15) slot radiating antenna / radiating surface (lower surface of 34, Figure 13)

Tokuda does not teach a specific thickness "D" (" t ", Figure 13; column 11; lines 11-25) for his dielectric plate. Tokuda does not teach a slot antenna where a part of the number of slots is closed.

Otsubo teaches a slot antenna (Figure 2) in a microwave plasma reactor (Figure 1) having a number of slots (5a) formed and distributed in the microwave radiating surface where a part of the number of slots can be closed (column 7, lines 3-15).

Ohmi teaches one end of a standing wave microwave is positioned on Ohmi's plasma exciting surface (top surface of 103; Figure 1), as claimed by claim 1, 2, 7, 8, 16, 17, 23, and 24 – "In order to prevent the discharge, the thickness of the dielectric material shower plate 103 is determined so that the gap is located at a position of a node of the standing wave of the microwave electric field." (column 12, line 66 – column 13, line 20).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Tokuda to optimize the thickness of the dielectric plate, and for Tokuda to use Otsubo's slot antenna, with Tokuda's radial line slot configuration.

Motivation for Tokuda to optimize the thickness of the dielectric plate, and for Tokuda to use Otsubo's slot antenna, with Tokuda's radial line slot configuration is for "easy" plasma generation as taught by Otsubo (column 19, lines 35-40) and circular TE_1 microwave generation for uniform and high density plasmas as taught by Tokuda (column 9, lines 7-30). Motivation for optimizing apparatus thicknesses is for forming stable plasmas as taught by Ohmi (column 13, lines 6-15)

Response to Arguments

6. Applicant's arguments with respect to claims 1-9, 12-14, and 16-26 have been considered but are moot in view of the new grounds of rejection.

7. Applicant states:

"

Accordingly, Tokuda cannot teach at least the combination of elements wherein no additional microwave radiating antenna is placed between the microwave radiating antenna and the dielectric body, a distance D between the microwave radiating surface and a surface of the

dielectric body facing away from the microwave radiating surface, which is represented with a wavelength of the microwave being a distance unit, is determined to be in a range satisfying an inequality, and wherein one end of the standing wave is positioned on the plasma exciting surface, as recited in Claims 1,2, 7, 8, 16, 17, 23, and 24.

"

8. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Further, as noted above in the Examiner's new grounds of rejection, Otsubo teaches only one microwave slot antenna (Figure 2), as claimed by claim 1,2,7,8,16,17,23, and 24.

Conclusion

9. Applicant's amendment necessitated the new grounds of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (571) 272-1442. The examiner can normally be reached on a Monday through Thursday schedule from 8am through 7pm. The official fax phone number for the 1763 art unit is (571) 273-8300. Any Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (571) 272-1700. If the examiner can not be reached please contact the examiner's supervisor, Parviz Hassanzadeh, at (571) 272-1435.